# Welcome to "Green Your Fleet"

presented by:

## Nashua Community College

and the

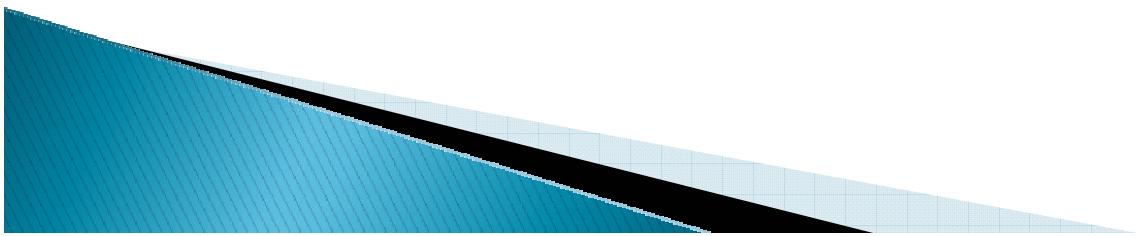
## Granite State Clean Cities Coalition

NCC is a Member of the

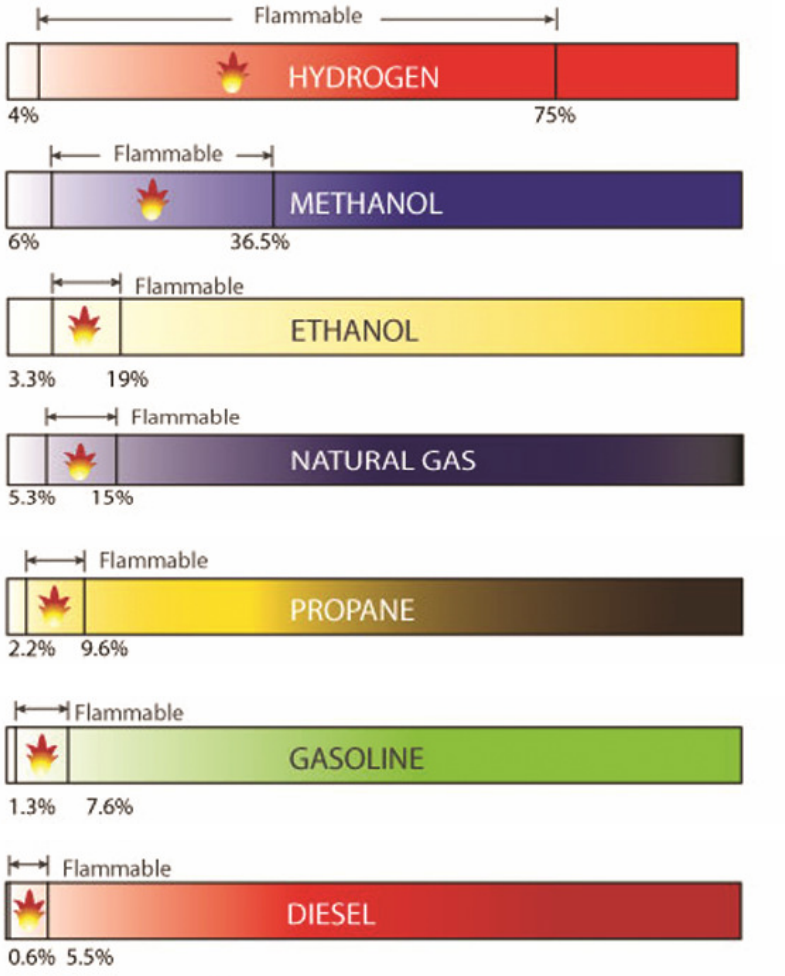
*National Alternative Fuels Training Consortium*

# The Alternative Fuels

- Biofuels: Ethanol and Biodiesel
- Gaseous Fuels: CNG, LNG, LPG, $H_2$
- Electricity
- Combinations: Hybrids, Bi-fuel, Dual-fuel



# Chemical Properties

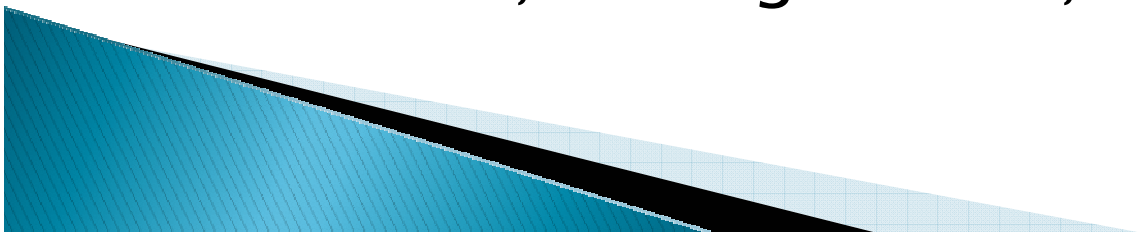



*Flammability Chart*

Source: NAHC

# Biodiesel (B100)

- Renewable (refined from vegetable oils, recycled cooking greases/oils, and animal fats)
- May be blended with petro diesel (B5, B10, B20)
- Uses a standard petro diesel engine that requires little or no modification
- Fuel supply system may need to be up-fitted to resist the strong solvent action of biodiesel
- Nontoxic, biodegradable, sulfur-free

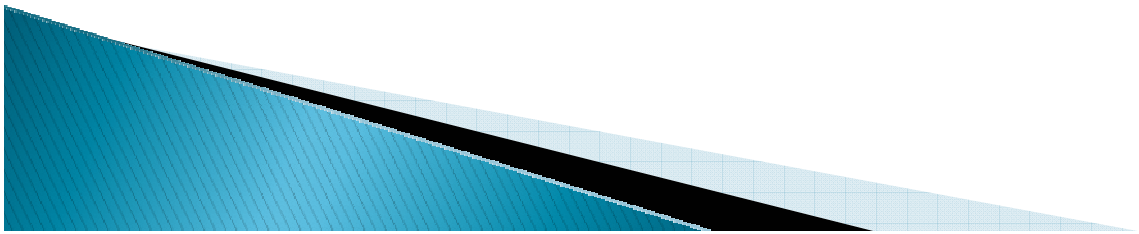


# Ethanol

- Renewable (distilled from corn, sugar cane, wheat, switchgrass)
- High octane, clean burning, reduces greenhouse gasses as compared to gasoline
- Domestically produced
- Usually mixed with gasoline E10, E85
- Fires are invisible in daylight
- Attracts water
- Strong solvent
- Fuel supply systems require modification

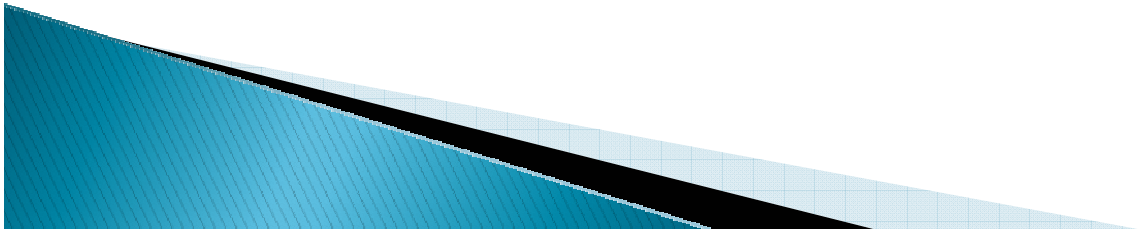
# Gaseous Fuels

- Compressed Natural Gas, CNG
- Liquefied Natural Gas, LNG
- Liquefied Petroleum Gas, LPG (Propane)
- Hydrogen



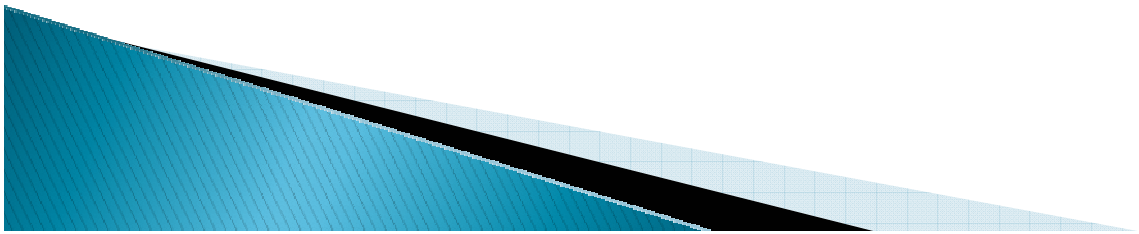
# CNG

- Domestic supply
- Infrastructure is improving
- Stored at high pressures (3600 psig)
- Economical
- Standard IC engine needs few modifications
- Excellent safety record
- Vehicles may be dedicated, dual fuel, or bi-fuel
- Clean burning, lower emissions
- No liquid fuel, less carbon= cleaner oil



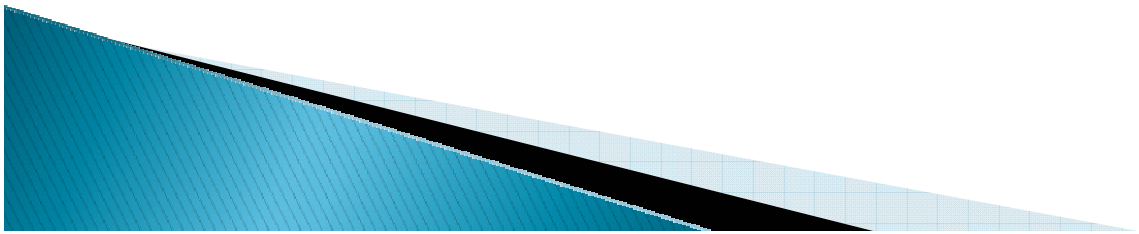
# LNG

- Domestic supply
- Infrastructure needs work
- Stored as a cryogenic liquid @ -259°F
- Storage pressure <250 psig
- Engines are identical to those used for CNG
- Shelf life is short
- Clean burning, lower emissions
- No liquid fuel, less carbon= cleaner oil



# LPG

- Readily available
- Remains liquid under low pressure
- Standard IC engine needs few modifications
- Requires a different fuel *supply* system
- Fewer emissions than gasoline
- Heavier than air, vapors pool
- Available as dedicated, converted, or bi-fuel

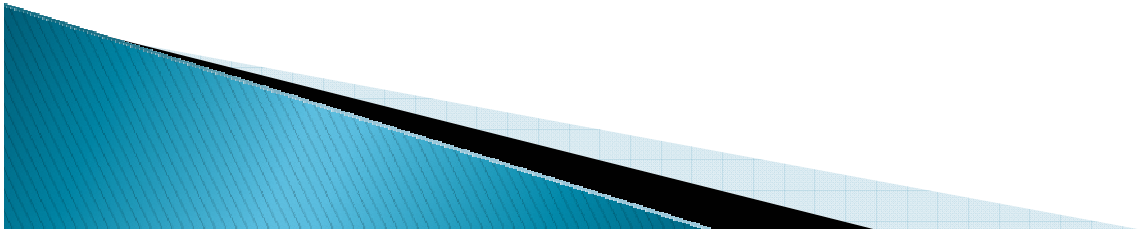



LIQUID
03.20.2012 15:46


FUEL CELL
03.21.2012 09:34

# Hydrogen

- Does not occur separately in nature
- Very expensive
- Not readily available
- Highly flammable
- High energy content
- May be used in an IC engine or a PEM
- Zero (harmful) emissions
- High storage pressure

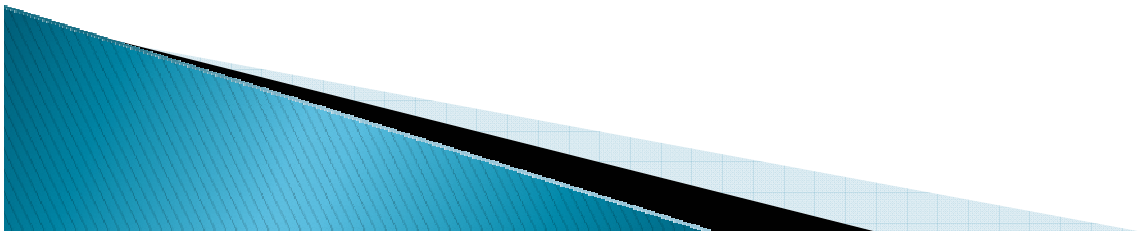



FUEL CELL
03.21.2012 10:46


FREIGHTLINER
NATURAL GAS
TECHNOLOGY
02.29.2012 13:03

# CNG Components

- Storage tanks: 4 types (up to 3600 psig)
- Solenoid valve (in tank)
- Manual valve (accessible from under vehicle)
- SS 316 lines and fittings (typically ¼")
- One or more TAPRD
- Coalescing filter (to remove oil & moisture)
- One, two, or three step pressure regulators
- Fuel rails operate at 40-80 psig
- Venting system




Aluminum Cylinder (3600 p.s.i.)
w/Fiber Glass Hoop Wrap
05.14.2012 08:37


05.14.2012 08:37

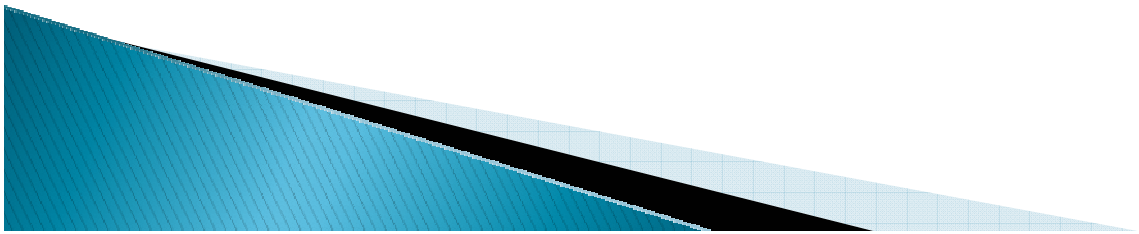

FR
FR
FR
FR
CNG ONLY
NGV2-4
3600 PSI
BRUNSWICK COMPOSITES
SN 05-018
MODEL # RB36A12-024HK
8-94/180°F
DO NOT USE AFTER
2009
05.16.2012 14:40


FFC-112-SS-SAE
ELEMENT# CLS112
FLOW
3,600 PSI RATING
CAUTION: DO NOT SERVICE OR DRAIN UNDER PRESSURE. DOING SO MAY CAUSE SERIOUS INJURY.
PARKER HANNIFIN CORP.
RACOR DIVISION
MODESTO, CA 95353 USA
800/344-3286
209/521-7860, FAX 209/529-3278
RACOR
Parker
05.15.2012 11:01


05.18.2012 13:41

# CNG Differences

- No vaporization problems in cold weather
- Fuel rails operate similarly at 40-80 psig
- No quenching, high temp valves & heads required
- Somewhat shorter range
- No EVAP emissions or systems
- Engine oil stays clean
- Higher octane =higher compression, 12.5:1




All Electric
Vehicle
Zero
Pollution
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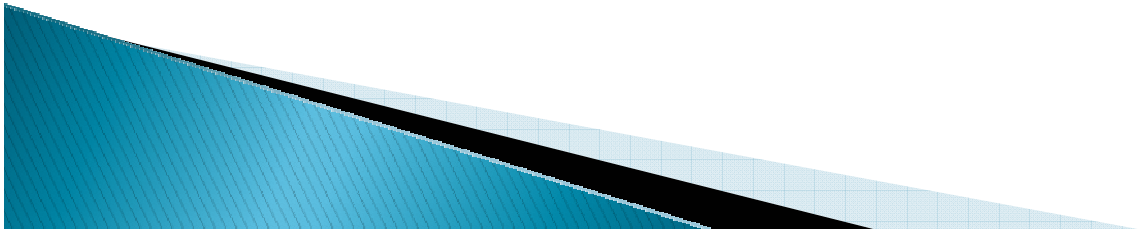
# Electricity

- Zero tailpipe emissions
- Infrastructure is improving
- Charge at home
- Shorter range



# Hybrid/Plug in Hybrid

- High mileage
- Above average low speed performance
- Gaining popularity